

HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Hatchery Program:

Soos Creek/Icy Creek Fall Chinook
Yearling Program

**Species or
Hatchery Stock:**

Fall Chinook (*Onchorynchus tshawytscha*)
Green River

Agency/Operator:

Washington Department of Fish and Wildlife

Watershed and Region:

Green River
Puget Sound

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SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1) Name of hatchery or program.

Icy Creek (Green River) Hatchery Yearling Chinook Program.

1.2) Species and population (or stock) under propagation, and ESA status.

Green River Fall Chinook.

1.3) Responsible organization and individuals

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Other agencies, Tribes, co-operators, or organizations involved, including contractors, and extent of involvement in the program:

In addition to the WDFW Icy Creek production; 600,000 eyed eggs are transferred to the Muckleshoot Tribe at the Keta Creek Hatchery and approximately 2,000 eyed eggs are given to local school groups.

1.4) Funding source, staffing level, and annual hatchery program operational costs.

Funding is by the Puget Sound Recreational Enhancement fund.

1.5) Location(s) of hatchery and associated facilities.

Soos Creek Hatchery: Big Soos Creek (09.0072), trib to the Green River (09.0001).

Icy Creek Hatchery: Icy Creek, trib to the Green River (09.0001) at RM 48.3.

Palmer Ponds: Spring Creek, tributary to the Green River, at RM 53

1.6) Type of program.

Integrated Harvest.

1.7) Purpose (Goal) of program.

Augmentation

The goal of this program is to provide harvest opportunity. The Icy Creek yearling program is 100% mass marked (per yearly MOU with the Muckleshoot tribe) to allow monitoring and evaluation of the NOR/HOR spawning ground ratios.

1.8) Justification for the program.

This program will be operated to provide fish for harvest while minimizing adverse genetic, demographic or ecological effects on listed fish. This will be accomplished in the following manner:

- 1) Yearling chinook will be released as smolts to minimize emigration time to saltwater thereby minimizing potential competition with and predation on natural-origin listed fish.
- 2) Yearling chinook will be released after the usual wild chinook emigration time to minimize potential adverse interactions.
- 3) All yearling chinook released will be acclimated at a hatchery facility capable of trapping the majority of returning adults. This practice will minimize straying and make possible the removal or regulation of hatchery fish allowed to spawn naturally.
- 4) All yearling chinook will be mass marked with an adipose fin clip to distinguish them from wild or naturally spawning chinook.
- 5) Adult chinook produced from this program will be harvested at a rate that allows adequate escapement of listed chinook.

Yearling chinook released from the Icy Creek Rearing Pond provide adult fish which are harvested in fisheries throughout the northeastern Pacific coast. On average, 88% of the harvest occurs in Washington State waters. Fisheries in the terminal area are managed to achieve the 5,800 fish escapement goal for the natural component of the Green River stock.

1.9) List of program Performance Standards .

1.10) List of program Performance Indicators .

Performance Standards and Indicators for Puget Sound **Integrated Harvest** Chinook programs.

Performance Standard	Performance Indicator	Monitoring and Evaluation Plan
Produce adult fish for harvest	Survival and contribution rates	Monitor catch and measuring survivals by periodical CWT data.
Meet hatchery production goals	Number of juvenile fish released - 300,000 yearlings	Estimating number of fish planted (weighing / counting fish), monitoring proximity to hatchery production goals, number released recorded on hatchery divisions "plant reports", data available on WDFW data base. Future Brood Documents.
Manage for adequate escapement	Hatchery and wild return rates	Monitoring hatchery/wild return rates through trapping (at the hatchery or at weir), redd and snorkel surveys on the spawning grounds plus catch records.

Minimize interactions with listed fish through proper broodstock management	Total number of broodstock collected - 140 Soos Creek adults needed for yearling program	Measuring number of fish actually spawned and killed to meet egg take goal at the hatchery. Hatchery Records.
	Sex ratios	Hatchery Records, Spawning Guidelines
	Timing of adult collection/spawning - early September to mid- October	Start trapping prior to historical start of the run, continue trapping throughout the run, dates and times are recorded on hatchery divisions "adult reports", data available on WDFW data base.
	Number of listed fish passed upstream - to be determined	CWT data and spawning ground surveys
	Hatchery stray rate	Hatchery records
	Number wild fish used in broodstock - See section 2.2.3	Hatchery records
	Return timing of hatchery / wild adults - early September to late October/late August to late October	Hatchery records Spawning Guidelines
	Adherence to spawning guidelines - 1:1 with the use of a backup male, if needed	

Minimize interactions with listed fish through proper rearing and release strategies	Juveniles released as smolts	Future Brood document and Hatchery records
	Out-migration timing of listed fish / hatchery fish May/April	Hatchery records and historical natural out-migrant data
	Size and time of release 10 fpp/April release	FBD and Hatchery records
Maintain stock integrity and genetic diversity	Effective population size	CWT data and mark / unmarked ratios of adults
	Hatchery-Origin Recruit spawners	Spawning Guidelines
Maximize in-hatchery survival of broodstock and their progeny; and Limit the impact of pathogens associated with hatchery stocks, on listed fish	Fish pathologists will monitor the health of hatchery stocks on a monthly basis and recommend preventative actions / strategies to maintain fish health	Spawning ground surveys
	Fish pathologists will diagnose fish health problems and minimize their impact	
	Vaccines will be administered when appropriate to protect fish health	
		Co-Managers Disease Policy

	A fish health database will be maintained to identify trends in fish health and disease and implement fish health management plans based on findings	
	Fish health staff will present workshops on fish health issues to provide continuing education to hatchery staff.	
Ensure hatchery operations comply with state and federal water quality standards through proper environmental monitoring	NPDES compliance	Monthly NPDES records

1.11) Expected size of program.

1.11.1) Proposed annual broodstock collection level (maximum number of adult fish).

1.11.2) Proposed annual fish release levels (maximum number) by life stage and location.

WDFW shall limit, as the management intent, annual production of fall chinook for on-station release at Icy Creek Hatchery to a total, maximum of 300,000 yearlings. Limiting juvenile production to current (proposed) levels will help retain, and not forestall, potential future options for the recovery of the listed chinook ESU.

Life Stage	Release Location	Annual Release Level
Eye Eggs		
Unfed Fry		
Fry		
Fingerling		
Smolts	Icy Creek Hatchery	300,000

1.12) Current program performance, including estimated smolt-to-adult survival rates, adult production levels, and escapement levels. Indicate the source of these data.

For brood years 1987-93 (excluding 1991), the average adult return was 3,080 to harvest, 221 to the Soos Creek hatchery rack and 2,160 to natural spawners (WDFW coded-wire tag data). Average smolt-to-adult return rate was 0.01260 to harvest, 0.00089 to rack and 0.00753 to natural spawners.

Data for estimating the Icy Creek yearling-to-adult survival rate, total production and escapement comes from analysis of coded-wire tag recoveries for this stock component. These data are available for yearlings released at Icy Creek from 1989 through 1995 (excluding 1991) and recovered in fisheries and escapements from 1990 through 1997 as age 3, 4, and 5 fish.

Icy Creek yearling smolt-to-adult survival (to age 3 or greater) for these release years (89-95) averaged 2.09% and the average adult production was 5,461 per release year. The number of adults escaping all fisheries and returning to either the Soos Creek hatchery or the spawning grounds averaged 2,381 per release year. An average of 221 adults per release year returned to the hatchery and 2,160 to the spawning grounds.

1.13) Date program started (years in operation), or is expected to start.

Yearlings have been released since 1983.

1.14) Expected duration of program.

Ongoing.

1.15) Watersheds targeted by program.

Green River (09.0001).

1.16) Indicate alternative actions considered for attaining program goals, and reasons why those actions are not being proposed.

SECTION 2. PROGRAM EFFECTS ON ESA-LISTED SALMONID POPULATIONS.

2.1) List all ESA permits or authorizations in hand for the hatchery program.

None.

2.2) Provide descriptions, status, and projected take actions and levels for ESA-listed natural populations in the target area.

2.2.1) Description of ESA-listed salmonid population(s) affected by the program.

- Identify the ESA-listed population(s) that will be directly affected by the program.

Duwamish/Green Summer/Fall Chinook.

The mean age ratio of chinook carcasses sampled on Green River spawning grounds in return years 1988 through 1997 was 5.5% age 2, 19.1% age 3, 64.4% age 4, 10.9% age 5 and 0.1% age 6. The adult sex ratio of sampled carcasses in 1999 was 52% male and 48% female. At age 3, 4, 5 and 6, adults average 60 to 80 cm., 80 to 95 cm., 85 to 100 cm. and 95 to 105 cm., respectively.

Most naturally-spawned Green River chinook migrate to saltwater after spending only a few months in freshwater. Arrival of both hatchery and naturally-produced smolts in the estuary peaks in May, and after a few weeks, most begin moving to near-shore feeding grounds in Puget Sound and the Pacific Ocean. Sexually mature fish begin arriving back at the river mouth as early as July. The upstream migration peaks in late August to mid-September. Spawning begins in early September, peaks in early October and is generally complete by early November.

Adults spawn in the mainstem Green River from about RM 25.4 in Kent to the City of Tacoma diversion dam at RM 61. Approximately 70% of natural spawning occurs upriver from the mouth of Soos Creek (RM 33.7). Tributary spawning occurs in the lower 4 miles of both Soos and Newaukum Creeks.

- Identify the ESA-listed population(s) that may be incidentally affected by the program.

Snohomish Summer/Fall Chinook, N. Lake Washington Tribs Summer/Fall Chinook, Issaquah Summer/Fall Chinook, Cedar River Summer/Fall Chinook

2.2.2) Status of ESA-listed salmonid population(s) affected by the program.

- Describe the status of the listed natural population(s) relative to critical and viable population thresholds

Critical and viable population thresholds under ESA have not been determined, however, the SASSI report (WDFW) determined this population (Duwamish/Green Summer/Fall Chinook) to be "healthy".

- Provide the most recent 12 year (e.g. 1988-present) progeny-to-parent ratios, survival data by life-stage, or other measures of productivity for the listed population. Indicate the source of these data.

Icy Creek yearling smolt-to-adult survival (to age 3 or greater) for release years 1989-1995 (excluding 1991) averaged 2.09% and the average adult production was 5,461 per release year. The number of adults escaping all fisheries and returning to either the Soos Creek hatchery or the spawning grounds averaged 2,381 per release year. An average of 221 adults per release year returned to the hatchery and 2,160 to the spawning grounds.

On average (return years 1987-98), each Green River natural spawner produces 2.33 adults returning to Washington waters. (WDFW Chinook Run-reconstruction Tables)

- Provide the most recent 12 year (e.g. 1988-1999) annual spawning abundance estimates, or any other abundance information. Indicate the source of these data.

Escapements have exceeded the 5,800 fish goal in 9 of the past 12 years (1988-99), with a range of 2,476 to 11,512. The 12-year average escapement is 7,598. (WDFW RR Tables)

- Provide the most recent 12 year (e.g. 1988-1999) estimates of annual proportions of direct hatchery-origin and listed natural-origin fish on natural spawning grounds, if known.

The ratio of Icy Creek origin adults in mainstem Green River natural spawners averaged 22.7% in 7 years between 1989 and 1997 (WDFW coded-wire tag data). Small sample sizes (<4%) in 5 of these years, and the limited area sampled (river mile 33.8 to 41.4), make this data less than reliable when applied to the entire river.

The ratio of Icy Creek origin adults in Newaukum Creek natural spawners averaged 18.8% in 9 years between 1989 and 1997 (WDFW coded-wire tag data). Sample rates averaged 30% per year.

2.2.3) Describe hatchery activities, including associated monitoring and evaluation and research programs, that may lead to the take of listed fish in the target area, and provide estimated annual levels of take .

- Describe hatchery activities that may lead to the take of listed salmonid populations in the target area, including how, where, and when the takes may occur, the risk potential for their occurrence, and the likely effects of the take.

Natural-origin adults make up approximately 39% (range of 26% to 45%) of the return to the Soos Creek hatchery each year. Since the Icy Creek yearling program requires about 140 adult broodstock to supply the required number of fry for the program, approximately 55 adults (ranges from 34 to 79) from the natural component of the Green River stock are annually spawned and incorporated into the egg take for the Icy Creek program.

The Soos Creek Hatchery adult weir is capable of trapping 100% of the adult chinook returning to Soos Creek at creek mile .8. Up to 3,500 adults are passes upstream annually without regard to origin. The delay and handling of these fish may result in a low take risk to listed fish. Upstream of the hatchery weir is the hatchery pump intake which may cause a very low take risk to adults passing the intake dam. The pump intake screens are believed to pose a low level risk to juvenile migrants due to the small screen size and the high volume of bypass water associated with the structure. The weir and hatchery intake has been identified for improvements in the WDFW capital budget process.

There is an unknown level of competition and predation associated with fish released from the hatchery.

There is a proposed temporary structure to be installed at Icy Creek to trap hatchery-origin chinook with an unknown take level of listed fish.

- Provide information regarding past takes associated with the hatchery program, (if known) including numbers taken, and observed injury or mortality levels for listed fish.

The incidental take of natural-origin adults as a result of the yearling hatchery program has probably been less than 80 fish per year, including pre-spawning mortality in adult holding areas at the Soos Creek hatchery.

- Provide projected annual take levels for listed fish by life stage (juvenile and adult) quantified (to the extent feasible) by the type of take resulting from the hatchery program (e.g. capture, handling, tagging, injury, or lethal take).

See "take" table at end of document.

- Indicate contingency plans for addressing situations where take levels within a given year have exceeded, or are projected to exceed, take levels described in this plan for the program.

Prior to mass marking taking effect, if take levels are projected to be exceeded for both juveniles and adults, WDFW will consult with NMFS in a timely manner.

SECTION 3. RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES

3.1) Describe alignment of the hatchery program with any ESU-wide hatchery plan (e.g. *Hood Canal Summer Chum Conservation Initiative*) or other regionally accepted policies (e.g. the NPPC *Annual Production Review Report and Recommendations* - NPPC document 99-15). Explain any proposed deviations from the plan or policies.

None.

3.2) List all existing cooperative agreements, memoranda of understanding, memoranda of agreement, or other management plans or court orders under which program operates.

Legislatively mandated Puget Sound Recreational Enhancement Program.

3.3) Relationship to harvest objectives.

3.3.1) Describe fisheries benefitting from the program, and indicate harvest levels and rates for program-origin fish for the last twelve years (1988-99), if available.

Annual releases of yearlings from Icy Creek pond contribute, on average, 3,149 age 2 and older fish to North American fisheries (WDFW coded-wire tag data from 1989 through 1995 releases). 88% are caught in Washington waters. Harvest rates average 71.8% for all fisheries and 62.9% for Washington fisheries.

3.4) Relationship to habitat protection and recovery strategies.

None at this time.

3.5) Ecological interactions.

Icy Creek yearling chinook prey to an unknown extent on listed fish. Competition, with listed fish, according to the risk assessment, is high (Risk Assessment, WDFW, 2000).

SECTION 4. WATER SOURCE

4.1) Provide a quantitative and narrative description of the water source (spring, well, surface), water quality profile, and natural limitations to production attributable to the water source.

Soos Creek Hatchery is supplied by surface water from Soos Creek. Water is withdrawn via 4 pumps at the hatchery site. Pumps produce 13,500 gallons per minute (gpm). In addition, a small spring water supply (50 gpm) is utilized to incubate the eggs for the Icy Creek program.

Fish are transferred as fingerlings and are reared in spring water at the Icy Creek site until they are released as yearling smolts. The quality of the spring water is excellent but varies with the season from a low of 2.2 cfs in the late fall to 13 cfs in the late spring.

4.2) Indicate risk aversion measures that will be applied to minimize the likelihood for the take of listed natural fish as a result of hatchery water withdrawal, screening, or effluent discharge.

No salmonids are found upstream of the Icy Creek intake. Hatchery effluent shall meet or exceed NPDES Permit standards for discharge of pond cleaning waste or pond drawdown.

SECTION 5. FACILITIES

5.1) Broodstock collection facilities (or methods).

There is currently no adult trapping capacity at Icy Creek (2002). Consideration is taking place to install trap to collect adults at Icy Creek so as to reduce the hatchery / wild spawning interactions in the Green River.

5.2) Fish transportation equipment (description of pen, tank truck, or container used).

Fingerlings of Soos Creek origin are shipped to Icy Creek as pre-smolt fingerlings from Soos Creek utilizing tankers supplied with oxygen tanks and water pumps.

5.3) Broodstock holding and spawning facilities.

N.A.

5.4) Incubation facilities.

None at Icy Creek. All eggs are incubated and hatched in spring water at Soos Creek.

5.5) Rearing facilities.

Hatched fry are shipped to Palmer Ponds for early rearing until they are adipose-fin clipped. They are then shipped to Icy Creek for additional rearing to release. Icy Creek utilizes one 1/4 acre earthen rearing pond which can be split into two ponds.

5.6) Acclimation/release facilities.

Fish will be transferred to Icy Creek from Palmer Ponds where they will be reared during this time frame totally on Icy Creek water prior to release.

5.7) Describe operational difficulties or disasters that led to significant fish mortality.

None.

5.8) Indicate available back-up systems, and risk aversion measures that will be applied, that minimize the likelihood for the take of listed natural fish that may result from equipment failure, water loss, flooding, disease transmission, or other events that could lead to injury or mortality.

Icy Creek is gravity flow fed and there is little risk of water loss. At Soos Creek, alarm systems are in place as well as personnel on 24 hour standby.

SECTION 6. BROODSTOCK ORIGIN AND IDENTITY

Describe the origin and identity of broodstock used in the program, its ESA-listing status, annual collection goals, and relationship to wild fish of the same species/population.

6.1) Source.

This stock originates from adults trapped at Soos Creek.

6.2) Supporting information.

6.2.1) History.

The Soos Creek Hatchery chinook were founded with chinook originating from the Green River. Some additional stocks were occasionally imported in the early days of the hatchery operation but their contribution is not considered significant. The program has depended upon volunteer returns for decades.

6.2.2) Annual size.

The Icy Creek yearling program requires about 140 adult broodstock to supply the required number of fry for the program.

6.2.3) Past and proposed level of natural fish in broodstock.

At Soos Creek, the level of natural broodstock which strays into the trap has been estimated at a rate of 39% (range of 26% to 45%) of the rack escapement (Cropp, et. al, 1999). Since the Icy Creek yearling program requires about 140 adult broodstock to supply the required number of fry for the program, approximately 55 adults (ranges from 34 to 79) from the natural component of the Green River stock are annually spawned and incorporated into the egg take for the Icy Creek program.

6.2.4) Genetic or ecological differences.

None known.

6.2.5) Reasons for choosing.

Locally adapted stock.

6.3) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish that may occur as a result of broodstock selection practices.

At the present time we have no ability to distinguish between chinook of hatchery and natural origin. WDF&W has a two year agreement with the Muckleshoot Tribe to mass mark the 1999 and 2000 brood chinook

SECTION 7. BROODSTOCK COLLECTION

7.1) Life-history stage to be collected (adults, eggs, or juveniles).

Adults

7.2) Collection or sampling design.

At the parent facility, Soos Creek, returning adults are trapped, volitionally, in an in-stream weir. Peak returns occur between early September and mid October with the range from August to late October. If prescribed, adults are individually counted upstream, past the weir, to spawn naturally. Except when hand counted, adults normally have no access past the hatchery. Numerous adults stop short of entering the weir and spawn in the gravel bars downstream of the hatchery. Broodstock for the Icy Creek program are sequestered from a representative portion of early green female returns. Green female adults are required to allow for inoculation with erythromycin for Bacterial Kidney Disease (BKD) control and suppression in the fingerling offspring (See section 7.4.1).

7.3) Identity.

See sections 6.2.1 and 7.2.

7.4) Proposed number to be collected:

7.4.1) Program goal (assuming 1:1 sex ratio for adults):

140 adults (70 males and 70 females)

7.4.2) Broodstock collection levels for the last twelve years (e.g. 1988-99), or for most recent years available:

Out of the 3,500 adults needed for egg-take goal, 140 are needed for the yearling program.

Year	Adults Females	Males	Jacks	Eggs	Juveniles
1988	See Soos Creek Fingerling HGMP				
1989					
1990					
1991					
1992					
1993					
1994					
1995					
1996					
1997					
1998					
1999					

7.5) Disposition of hatchery-origin fish collected in surplus of broodstock needs.

Unspawned adults are either donated to local food banks or sold to the carcass buyer for processing for human consumption or sent upstream to spawn naturally.

7.6) Fish transportation and holding methods.

Does not apply.

7.7) Describe fish health maintenance and sanitation procedures applied.

Standard fish health protocols, as defined in the Co-Manager Fish Health Manual (WDFW 1996), are adhered to.

7.8) Disposition of carcasses.

At the parent facility, Soos Creek, spawned carcasses are utilized for nutrient enhancement or sold to a carcass buyer for rendering into meal. Unspawned adults are either donated to local food banks or sold to the carcass buyer for processing for human consumption. Pond mortality is utilized for nutrient enhancement purposes.

7.9) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the broodstock collection program.

Procedures set forth in the Co-Managers Fish Health Policy and the WDF&W spawning guidelines (Seidel, 1983) will be adhered to. Broodstock collected in future will be marked indicating hatchery origin.

SECTION 8. MATING

Describe fish mating procedures that will be used, including those applied to meet performance indicators identified previously.

8.1) Selection method.

Females are chosen randomly from ripe fish. Depending upon the magnitude of the returns, our aim is to spawn all ripe females each spawn day. Males are selected randomly. Matings are 1:1. About 1% of males used are "jacks". If female numbers exceed hatchery need, eggs are taken randomly from later spawning females, to represent that portion of the run, and the remaining females are "surplused", i. e., removed from the breeding pool. As prescribed, fish exceeding hatchery need adults may be passed upstream to spawn naturally (at Soos Creek).

8.2) Males.

Males are selected randomly. Matings are 1:1, but if a male killed for spawning is not fully ripe or has very little sperm, another male is used to assure fertilization of the eggs. About 1% of males used are "jacks".

8.3) Fertilization.

All fish are mated 1:1. The eggs from 1 female are collected in a bucket. The sperm from one male is expressed directly onto the eggs and mixed gently. The mix is allowed to sit for 30 to 60 seconds and then pooled in a common bucket with other eggs. They then go into the hatchery.

8.4) Cryopreserved gametes.

Not employed.

8.5) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the mating scheme.

At the parent facility, Soos Creek, one to one matings will be utilized to maximize the number of spawners incorporated in the gene pool. Marked adults will be selected, randomly from the entire run.

SECTION 9. INCUBATION AND REARING -

Specify any management goals (e.g. egg to smolt survival) that the hatchery is currently operating under for the hatchery stock in the appropriate sections below. Provide data on the success of meeting the desired hatchery goals.

9.1) Incubation:

9.1.1) Number of eggs taken and survival rates to eye-up and/or ponding.

350,000 eggs taken, on the average, annually to support the Icy Creek program. Green egg to fry survival (5 year average) is 89.8% (range 88.1% to 91.0%)

9.1.2) Cause for, and disposition of surplus egg takes.

On occasion, a surplus of eggs results from inaccurate green egg sampling at the time of egg take. Extra eggs are normally taken as a safeguard against potential incubation loss. Surplus fry, less than or equal to 10% are normally reared as part of the programmed releases. Additional excess was commonly released as un-fed fry or short-term reared fry. In recent years a greater emphasis has been placed on not exceeding the program goals.

9.1.3) Loading densities applied during incubation.

Eggs are eyed in shallow troughs, on pathogen free spring water, at a rate of 20,000 to 25,000 per basket. Egg are hatched in deep troughs, on pathogen free spring water, at a rate of about 26,000 per section.

9.1.4) Incubation conditions.

To minimize the potential of Bacterial Kidney disease infection, eggs are hatched with Vexar substrate using pathogen free spring water.

9.1.5) Ponding.

Ponding occurs when the fry have achieved >95% button-up status. Ponding is forced and occurs between late December and mid-January. Fry destined for Icy Creek are ponded on pathogen free spring water to minimize the risk of contracting BKD.

9.1.6) Fish health maintenance and monitoring.

Egg fungus is controlled with a 15 minute formalin drip at 100 parts per million (ppm), 5 days per week, until the eggs are shocked and picked. Dead eggs are removed with the aid of a "Jen-sorter" power egg picker. Coagulated yolk-sac incidence level is low.

9.1.7) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish during incubation.

A back-up generator is on-site to provide power for hatchery pumps (at Soos Creek) in the event of power loss. Eggs in the future will be from marked hatchery-origin adults.

9.2) Rearing:

9.2.1) Provide survival rate data (*average program performance*) by hatchery life stage (fry to fingerling; fingerling to smolt) for the most recent twelve years (1988-99), or for years dependable data are available..

Fry to smolt: Average is 91.7%; Range is 65.1 to 99.9%.

9.2.2) Density and loading criteria (goals and actual levels).

Loading goals conform to guidelines set out in Fish Hatchery Management (Piper, 1982). Maximum loading goals, in terms of pounds per gallons per minute (lbs/gpm) at release, equates to 1.5 x fish length in inches. Maximum densities, in terms of lbs /cubic foot of rearing space, equates to .3 x fish length in inches.

9.2.3) Fish rearing conditions

For fish destined for Icy Creek, all initial rearing vessels receive pathogen free spring water from a spring adjacent to Soos Creek. Thereafter, the fish are moved to an intermediate spring fed rearing site, at Palmer Ponds, on the Green River. From there, the fish are transferred to Icy Creek for final rearing and release. At all sites, incoming oxygen levels are saturated but are not normally monitored. Fish tanks are vacuumed as needed. At Icy Creek the fish are reared in a gravel bottomed pond. The pond does not normally require routine cleaning due to natural breakdown of waste products.

9.2.4) Indicate biweekly or monthly fish growth information (*average program performance*), including length, weight, and condition factor data collected during rearing, if available.

Not available.

9.2.5) Indicate monthly fish growth rate and energy reserve data (*average program performance*), if available.

Not available.

9.2.6) Indicate food type used, daily application schedule, feeding rate range (e.g. % B.W./day and lbs/gpm inflow), and estimates of total food conversion efficiency during rearing (*average program performance*).

Feed type is a salmon formulation of dry crumbles or pellets. Feed brand varies with the contract price. Initially, fish are fed daily at a rate approximating 2% B.W. /day. Final feed rates average $\leq 1\%$ B.W./day. The maximum feed rate goal is approximately .1 lb feed per gpm inflow. Feed conversions depend upon the diet and formulation but range between .8 - 1.1: 1.

9.2.7) Fish health monitoring, disease treatment, and sanitation procedures

Ponds are vacuumed weekly or as-needed. Fish Health Specialists make scheduled visits to check on fish health. Medications or alternate management plans derive from these checks. When emptied, all ponds are cleaned, air dried and sun-sanitized if possible.

9.2.8) Smolt development indices (e.g. gill ATPase activity), if applicable.

Not applicable.

9.2.9) Indicate the use of "natural" rearing methods as applied in the program.

Not applicable.

9.2.10) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish under propagation.

SECTION 10. RELEASE

Describe fish release levels, and release practices applied through the hatchery program.

10.1) Proposed fish release levels. *(Use standardized life stage definitions by species presented in Attachment 2.*

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Eggs				
Unfed Fry				
Fry				
Fingerling				
Yearling	300,000	10	April	Icy Creek

10.2) Specific location(s) of proposed release(s).

Stream, river, or watercourse:

Icy Creek (09.)

Release point:

Icy Creek , tributary of Green River at RM 48.3

Major watershed:

Green River (09.0001)

Basin or Region:

Puget Sound

10.3) Actual numbers and sizes of fish released by age class through the program.

Release year	Eggs/ Fry	Unfed	Avg size	Fry	Avg size	Fingerling	Avg size	Yearling	Avg size
1988								222,890	5
1989								496,129	8
1990								320,136	9
1991								647,950	8
1992								293,771	10
1993								310,000	10
1994								215,100	7
1995								320,100	7
1996								330,547	14
1997								344,961	9
1998								312,834	7
1999								318,053	11
2000								146,610	9
2001								241,300	8
Average								322,884	9

10.4) Actual dates of release and description of release protocols.

The fish are allowed to volitionally release from the pond starting in April. Any remaining fish will be forced from the pond.

10.5) Fish transportation procedures, if applicable.

At Icy Creek, not applicable.

10.6) Acclimation procedures.

Fish will be transferred to Icy Creek from Palmer Ponds where they will be reared during this time frame totally on Icy Creek water prior to release.

10.7) Marks applied, and proportions of the total hatchery population marked, to identify hatchery adults.

The Icy Creek yearling program is 100% mass marked (per yearly MOU with the Muckleshoot tribe) to allow monitoring and evaluation of the NOR/HOR spawning ground ratios.

WDFW shall apply coded-wire tags to a portion of the yearling fall chinook production at Icy Creek Hatchery to allow for evaluation of fishery contribution and survival rates, and of straying levels to other Puget Sound watersheds.

10.8) Disposition plans for fish identified at the time of release as surplus to programmed or approved levels.

No surplus fish are reared at this site.

10.9) Fish health certification procedures applied pre-release.

Routine fish health inspection by the Area Fish Health Specialist.

10.10) Emergency release procedures in response to flooding or water system failure.

Depending upon circumstances, release fish with either the highest probability of surviving to adulthood or the fish with the highest probability of sustaining catastrophic loss if held at the hatchery.

10.11) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish resulting from fish releases.

To minimize the risk of residualization and impact upon natural fish, hatchery yearlings are released in April as smolts.

SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

11.1) Monitoring and evaluation of Performance Indicators presented in Section 1.10.

Note: See section 1.10 for Monitoring and Evaluation. The purpose of a monitoring program is to identify and evaluate the benefits and risks which may derive from the hatchery program. The monitoring program is designed to answer questions of whether the hatchery is providing the benefits intended, while also minimizing or eliminating the risks inherent in the program. A key tool in any monitoring program is having a mechanism to identify each hatchery production group.

Each production group shall be identified with distinct otolith marks, adipose clips, coded wire tags, blank wire tags or other identification methods as they become available, to allow for evaluation of each particular rearing and/or release strategy. This will allow for selective harvest on hatchery stocks when appropriate, monitoring of interactions of hatchery and wild fish wherever they co-mingle in riverine, estuarine and marine habitats and assessment of the status of the target population. WDFW shall monitor the chinook salmon escapement into the target and non-target chinook populations to estimate the number of tagged, un-tagged and marked fish escaping into the river each year and the stray rates of hatchery chinook into the rivers.

11.1.1) Describe plans and methods proposed to collect data necessary to respond to each Performance Indicator identified for the program.

See section 1.10 for Monitoring and Evaluation.

WDF&W mass marks 100% of the yearling release to allow for monitoring and evaluation of chinook escapement to the Green River. This monitoring will assist in the monitoring of the NOR/HOR spawning ground ratios and assessment of the status of the target population.

WDFW shall monitor chinook salmon escapement to the Green River sites to estimate the number of tagged, untagged, and marked fish escaping to the river each years. This monitoring will allow for assessment of the status of the target population and the success of the program in achieving restoration objectives.

11.1.2) Indicate whether funding, staffing, and other support logistics are available or committed to allow implementation of the monitoring and evaluation program.

Funding is currently available to mass mark the entire program. Escapement assessment has been undertaken for many years and is ongoing.

Funding and resources are currently committed to monitor and evaluate this program as detailed in the Resource Management Plan for Puget Sound Chinook Salmon Hatcheries (Washington Department of Fish and Wildlife and Puget Sound Treaty Tribes, August 23, 2002).

11.2) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish resulting from monitoring and evaluation activities.

Monitoring and evaluation will be undertaken in a manner which does not result in an unauthorized take of listed chinook.

SECTION 12. RESEARCH

12.1) Objective or purpose.

None at this time.

12.2) Cooperating and funding agencies.

12.3) Principle investigator or project supervisor and staff.

12.4) Status of stock, particularly the group affected by project, if different than the stock(s) described in Section 2.

12.5) Techniques: include capture methods, drugs, samples collected, tags applied.

12.6) Dates or time period in which research activity occurs.

12.7) Care and maintenance of live fish or eggs, holding duration, transport methods.

12.8) Expected type and effects of take and potential for injury or mortality.

12.9) Level of take of listed fish: number or range of fish handled, injured, or killed by sex, age, or size, if not already indicated in Section 2 and the attached take table (Table 1).

12.10) Alternative methods to achieve project objectives.

12.11) List species similar or related to the threatened species; provide number and causes of mortality related to this research project.

12.12) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse ecological effects, injury, or mortality to listed fish as a result of the proposed research activities.

SECTION 13. ATTACHMENTS AND CITATIONS

Cropp, Tom, Hage, Paul, 1999, Green River Chinook: Estimation of hatchery strays in the naturally spawning population, Washington Department of Fish and Wildlife, Olympia.

Piper, Robert, et. al., 1982, Fish Hatchery Management; United States Dept of Interior, Fish and Wildlife Service, Washington, DC.

Seidel, Paul, 1983, Spawning Guidelines for Washington Department of Fish and Wildlife Hatcheries, Washington Department of Fish and Wildlife, Olympia.

Washington Department of Fish and Wildlife. 1996. Fish Health Manual. Hatcheries Program, Fish Health Division, Washington Department of Fish and Wildlife, Olympia.

Washington Department of Fish and Wildlife. 1995. Hatchery Operation Plans and Performance Summaries, "HOPPS", Hatcheries Program, Fish Health Division, Washington Department of Fish and Wildlife, Olympia.

Washington Department of Fish and Wildlife, Muckleshoot Tribe, 4/4/00, Production and Mass Marking Agreement between the Muckleshoot Tribe and WDF&W.

Washington Department of Fish and Wildlife and Puget Sound Treaty Tribes, 2002, Puget Sound Chinook Salmon Hatcheries, Resource Management Plan, a component of Comprehensive Chinook Salmon Management Plan, August 23, 2002. 103 pages.

SECTION 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY

I hereby certify that the foregoing information is complete, true and correct to the best of my knowledge and belief. I understand that the information provided in this HGMP is submitted for the purpose of receiving limits from take prohibitions specified under the Endangered Species Act of 1973 (16 U.S.C.1531-1543) and regulations promulgated thereafter for the proposed hatchery program, and that any false statement may subject me to the criminal penalties of 18 U.S.C. 1001, or penalties provided under the Endangered Species Act of 1973.

Name, Title, and Signature of Applicant:

Certified by_____ Date:_____

Table 1. Estimated listed salmonid take levels of by hatchery activity.

Listed species affected: Chinook ESU/Population: Puget Sound Chinook Activity: Soos Creek Yearling Production				
Location of hatchery activity: Icy Creek Hatchery Dates of activity: December-June Hatchery program operator: WDFW _____				
Type of Take	Annual Take of Listed Fish By Life Stage (<i>Number of Fish</i>)			
	Egg/Fry	Juvenile/S molt	Adult	Carcass
Observe or harass a)				
Collect for transport b)				
Capture, handle, and release c)				
Capture, handle, tag/mark/tissue sample, and release d)				
Removal (e.g. broodstock) e)				
Intentional lethal take f)			34 to 79 *	
Unintentional lethal take g)	.	1.2 K to 42 K **		
Other Take (specify) h)				

a. Contact with listed fish through stream surveys, carcass and mark recovery projects, or migrational delay at weirs.

b. Take associated with weir or trapping operations where listed fish are captured and transported for release.

c. Take associated with weir or trapping operations where listed fish are captured, handled and released upstream or downstream.

d. Take occurring due to tagging and/or bio-sampling of fish collected through trapping operations prior to upstream or downstream release, or through carcass recovery programs.

e. Listed fish removed from the wild and collected for use as broodstock.

f. Intentional mortality of listed fish, usually as a result of spawning as broodstock.

g. Unintentional mortality of listed fish, including loss of fish during transport or holding prior to spawning or prior to release into the wild, or, for integrated programs, mortalities during incubation and rearing.

h. Other takes not identified above as a category.

* See Section 2.2.3 for further detail

** The potential mortality portion of total Icy Creek program which may be of wild-origin parents, bases on hatchery/wild rations described in section 2.2.3.